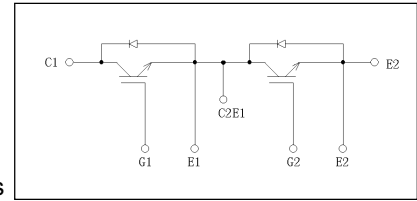


# 2MBI400U2B-060

## IGBT Module U-Series 600V / 400A 2 in one-package

### Equivalent Circuit Schematic



### Features

- High speed switching
- Voltage drive
- Low inductance module structure

### Applications

- Inverter for Motor drive
- AC and DC Servo drive amplifier
- Uninterruptible power supply
- Industrial machines, such as Welding machines

### Maximum ratings and characteristics

#### Absolute maximum ratings (at $T_c=25^\circ\text{C}$ unless otherwise specified)

Item	Symbol	Conditions	Rating	Unit	
Collector-Emitter voltage	$V_{CES}$		650	V	
Gate-Emitter voltage	$V_{GES}$		$\pm 20$	V	
Collector current	$I_c$	Continuous	400	A	
	$I_{cp}$	1ms	800		
	$-I_c$		400		
	$-I_c$ pulse		800		
Collector Power Dissipation	$P_c$	1 device	1250	W	
Junction temperature	$T_j$		+150	$^\circ\text{C}$	
Storage temperature	$T_{stg}$		-40 to +125		
Isolation voltage	between terminal and copper base *1	$V_{iso}$	AC:1min.	2500	VAC
Screw Torque	Mounting *2			3.5	N·m
	Terminals *2			3.5	

\*1 : All terminals should be connected together when isolation test will be done.

\*2 : Recommendable value : Mounting 2.5 to 3.5N·m(M5), Terminal 2.5 to 3.5 N·m(M5)

#### Electrical characteristics (at $T_j=25^\circ\text{C}$ unless otherwise specified)

Item	Symbols	Conditions	Characteristics			Unit	
			Min.	Typ.	Max.		
Zero gate voltage collector current	$I_{CES}$	$V_{GE}=0\text{V}$ , $V_{CE}=600\text{V}$	–	–	2.0	mA	
Gate-Emitter leakage current	$I_{GES}$	$V_{CE}=0\text{V}$ , $V_{GE}=\pm 20\text{V}$	–	–	400	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=20\text{V}$ , $I_c=400\text{mA}$	6.2	6.7	7.7	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE}=15\text{V}$ , $I_c=400\text{A}$	$T_j=25^\circ\text{C}$	–	2.25	2.55	V
			$T_j=125^\circ\text{C}$	–	2.50	–	
	$V_{CE(sat)}$ (chip)		$T_j=25^\circ\text{C}$	–	1.85	–	
			$T_j=125^\circ\text{C}$	–	2.10	–	
Input capacitance	$C_{ies}$	$V_{CE}=10\text{V}$ , $V_{GE}=0\text{V}$ , $f=1\text{MHz}$	–	29	–	nF	
Turn-on time	$t_{on}$	$V_{CC}=300\text{V}$	–	0.40	1.20	$\mu\text{s}$	
	$t_r$	$I_c=400\text{A}$	–	0.22	0.60		
	$t_{r(i)}$	$V_{GE}=\pm 15\text{V}$	–	0.16	–		
Turn-off time	$t_{off}$	$R_G=6.8\ \Omega$	–	0.48	1.20	$\mu\text{s}$	
	$t_f$		–	0.07	0.45		
Forward on voltage	$V_F$ (terminal)	$V_{GE}=0\text{V}$ $I_F=400\text{A}$	$T_j=25^\circ\text{C}$	–	2.00	2.35	V
			$T_j=125^\circ\text{C}$	–	2.05	–	
	$V_F$ (chip)		$T_j=25^\circ\text{C}$	–	1.60	–	
			$T_j=125^\circ\text{C}$	–	1.65	–	
Reverse recovery time	$t_{rr}$	$I_F=400\text{A}$	–	–	0.35	$\mu\text{s}$	
Lead resistance, terminal-chip*3	R lead		–	0.97	–	m $\Omega$	

\*3:Biggest internal terminal resistance among arm.

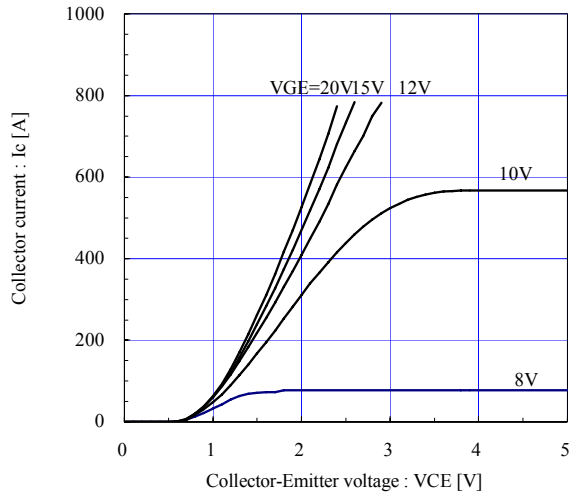
#### Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Unit
			Min.	Typ.	Max.	
Thermal resistance	$R_{th(j-c)}$	IGBT	–	–	0.10	$^\circ\text{C}/\text{W}$
	$R_{th(j-c)}$	FWD	–	–	0.16	$^\circ\text{C}/\text{W}$
Contact Thermal resistance	$R_{th(c-f)}$ *4	With thermal compound	–	0.025	–	$^\circ\text{C}/\text{W}$

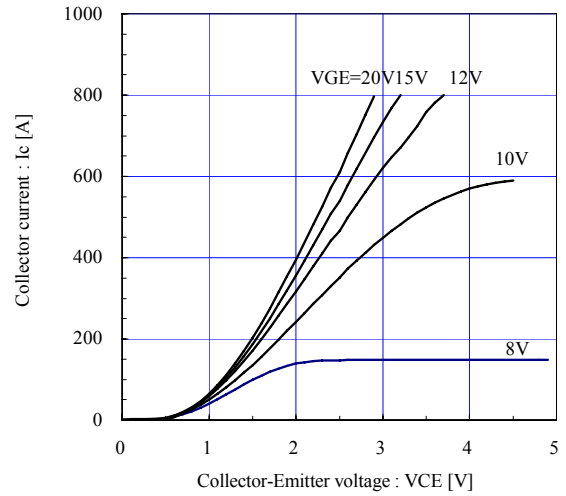
\*4 : This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

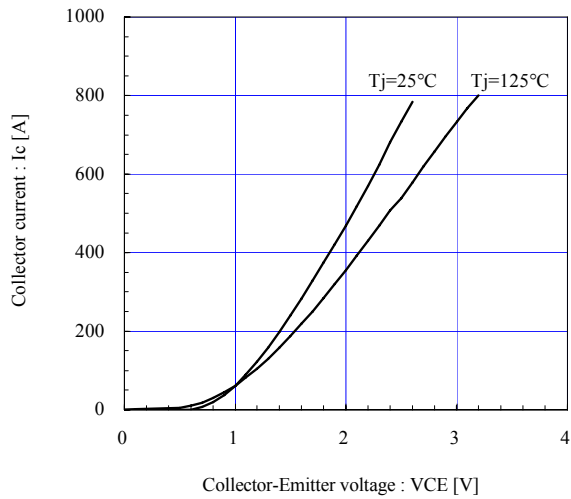
Collector current vs. Collector-Emitter voltage (typ.)  
Tj= 25°C / chip



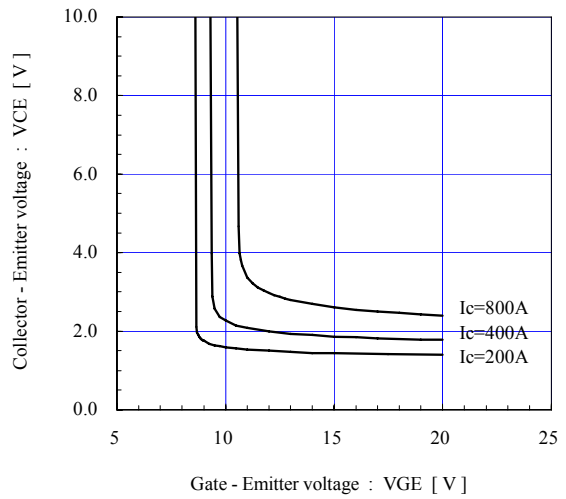
Collector current vs. Collector-Emitter voltage (typ.)  
Tj= 125°C / chip



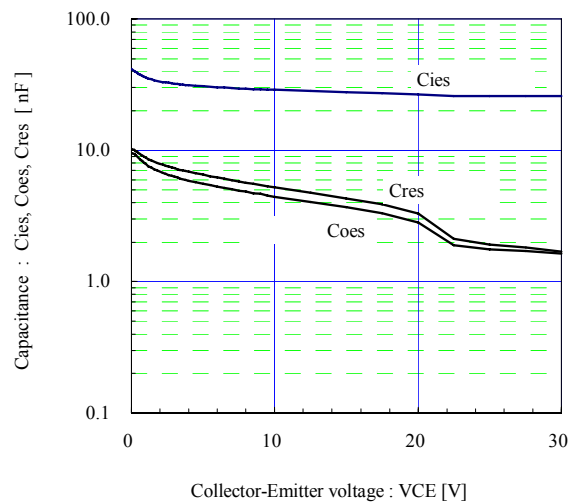
Collector current vs. Collector-Emitter voltage (typ.)  
VGE=15V / chip



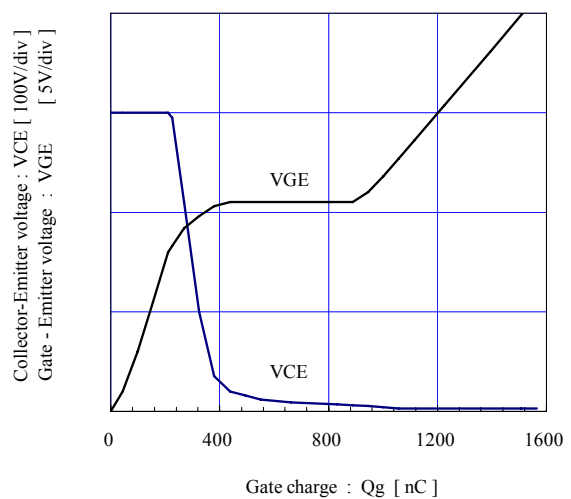
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)  
Tj=25°C / chip



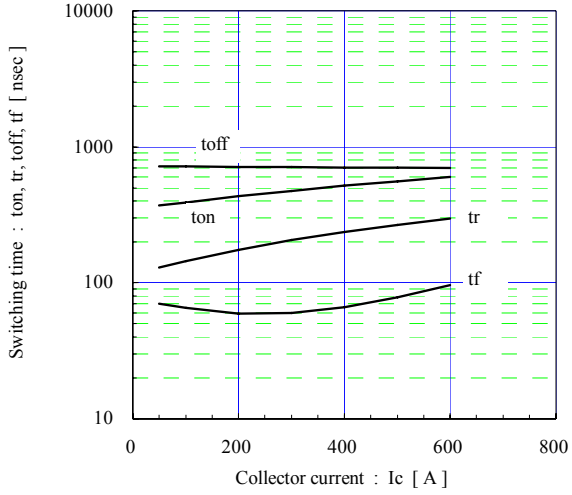
Capacitance vs. Collector-Emitter voltage (typ.)



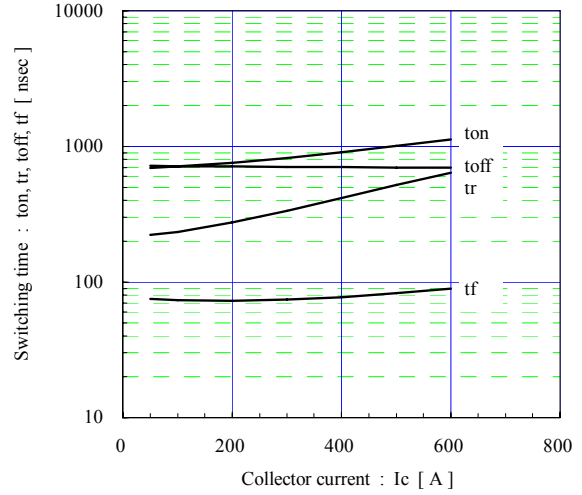
Dynamic Gate charge (typ.)  
Vcc=300V, Ic=400A, Tj= 25°C



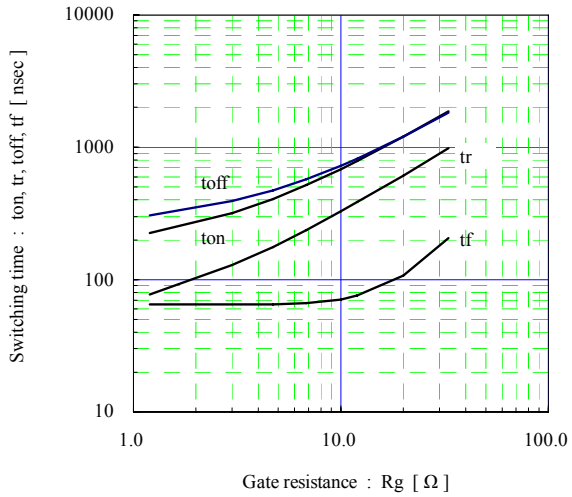
Switching time vs. Collector current (typ.)  
 $V_{cc}=300V, V_{GE}=\pm 15V, R_g=6.8\Omega, T_j=25^\circ C$



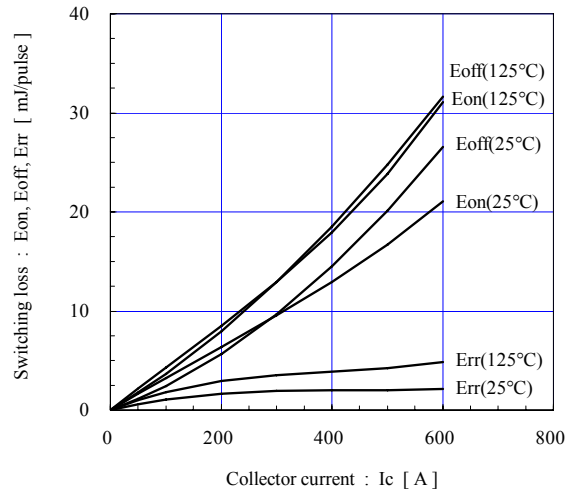
Switching time vs. Collector current (typ.)  
 $V_{cc}=300V, V_{GE}=\pm 15V, R_g=6.8\Omega, T_j=125^\circ C$



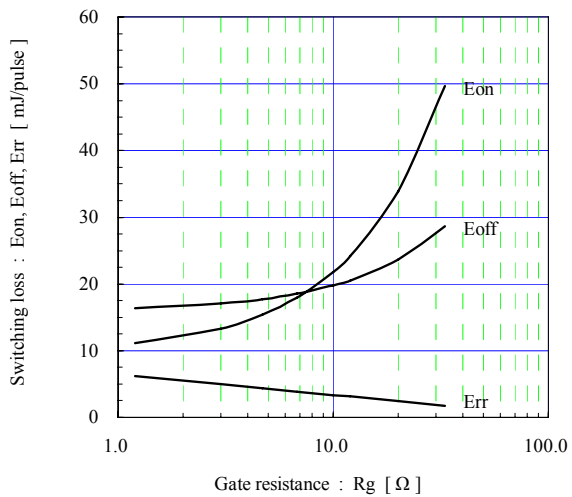
Switching time vs. Gate resistance (typ.)  
 $V_{cc}=300V, I_c=400A, V_{GE}=\pm 15V, T_j=25^\circ C$



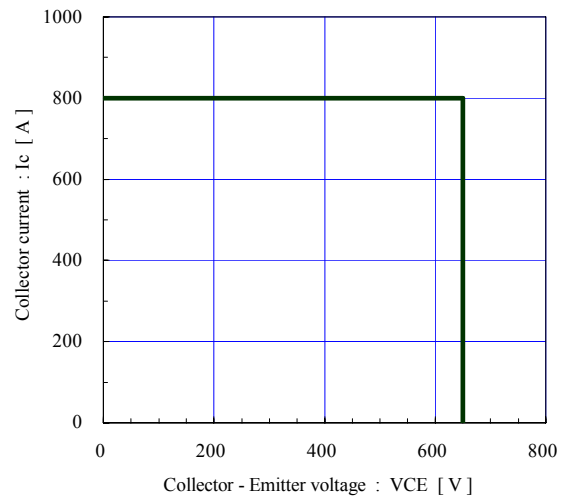
Switching loss vs. Collector current (typ.)  
 $V_{cc}=300V, V_{GE}=\pm 15V, R_g=6.8\Omega$



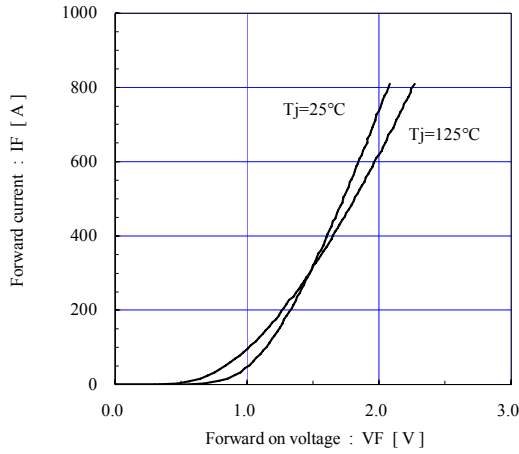
Switching loss vs. Gate resistance (typ.)  
 $V_{cc}=300V, I_c=400A, V_{GE}=\pm 15V, T_j=125^\circ C$



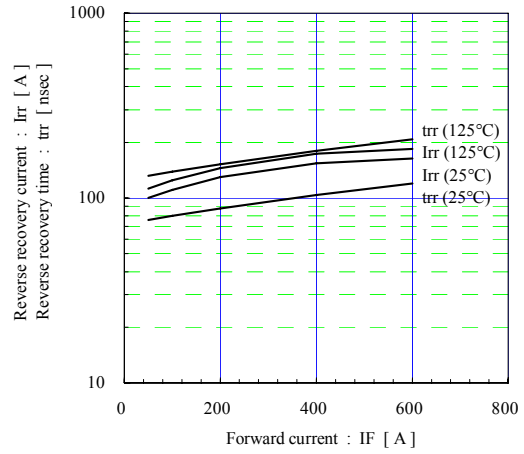
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \le 15V, R_g \ge 6.8\Omega, T_j \le 125^\circ C$



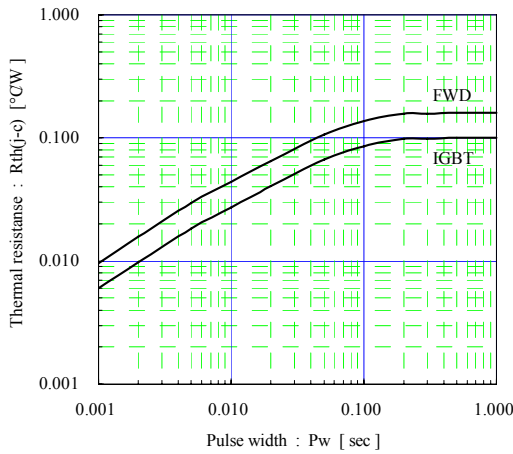
Forward current vs. Forward on voltage (typ.)  
chip



Reverse recovery characteristics (typ.)  
Vcc=300V, VGE=±15V, Rg=6.8Ω



Transient thermal resistance (max.)



■ Outline Drawings, mm

M233

